

**CLAIMS**

What is claimed is:

1. A read element for use in a data storage device, comprising:  
a magnetoresistive sensor having a side, and an upper surface that defines an edge;  
an underlayer that overlies the side of the magnetoresistive sensor;  
a hard bias layer that overlies at least part of the underlayer and that defines a hard bias junction with the underlayer;  
a lead formed atop the hard bias layer; and  
wherein the hard bias junction is recessed from the edge of the magnetoresistive sensor by a predetermined recess distance, to provide stability and sensitivity to the read element.
2. The read element of claim 1, wherein the lead extends toward the magnetoresistive sensor, between the hard bias junction and the magnetoresistive sensor edge.
3. The read element of claim 2, wherein the recess distance ranges between approximately 0.5 and 20 nm.
4. The read element of claim 1, wherein the underlayer extends to the magnetoresistive sensor edge.
5. The read element of claim 1, wherein the lead is recessed from the magnetoresistive sensor edge to form a flat profile of the shield layer over the upper surface of the magnetoresistive sensor, in order to reduce side track

reading.

6. The read element of claim 5, wherein the underlayer extends to a lead junction that is recessed from the magnetoresistive sensor edge by a lead recess distance.

7. The read element of claim 6, wherein the lead recess distance ranges between approximately 0.5 and 20 nm.

8. The read element of claim 4, wherein the flat profile of the shield layer extends over substantially the entire width of the magnetoresistive sensor.

9. The read element of claim 1, wherein the magnetoresistive sensor includes any one of: a spin valve, a giant magnetoresistive sensor (GMR), an anisotropy magnetoresistive sensor (AMR), and a colossal magnetoresistive sensor (CMR).

10. The read element of claim 1, further comprising a shield layer that overlies the lead and the magnetoresistive sensor.

11. A disk drive comprising:
  - a base;
  - a spindle motor attached to the base;
  - a disk positioned on the spindle motor;
  - a head stack assembly coupled to the base and comprising:
    - an actuator body;
    - an actuator arm cantilevered from the actuator body; and
    - a read element coupled to the actuator arm, and including:
      - a magnetoresistive sensor having a side, and an upper surface that defines an edge;
      - an underlayer that overlies the side of the magnetoresistive sensor;
      - a hard bias layer that overlies at least part of the underlayer and that defines a hard bias junction with the underlayer;
      - a lead formed atop the hard bias layer; and
      - wherein the hard bias junction is recessed from the edge of the magnetoresistive sensor by a predetermined recess distance, to provide stability and sensitivity to the read element.
12. The hard drive of claim 11, wherein the lead extends toward the magnetoresistive sensor, between the hard bias junction and the magnetoresistive sensor edge.
13. The hard drive of claim 12, wherein the recess distance ranges between approximately 0.5 and 20 nm.
14. The hard drive of claim 11, wherein the underlayer extends to the magnetoresistive sensor edge.

15. The hard drive of claim 11, wherein the lead is recessed from the magnetoresistive sensor edge to form a flat profile of the shield layer over the upper surface of the magnetoresistive sensor, in order to reduce side track reading.
16. The hard drive of claim 15, wherein the underlayer extends to a lead junction that is recessed from the magnetoresistive sensor edge by a lead recess distance.
17. The hard drive of claim 16, wherein the lead recess distance ranges between approximately 0.5 and 20 nm.
18. The hard drive of claim 14, wherein the flat profile of the shield layer extends over substantially the entire width of the magnetoresistive sensor.
19. The hard drive of claim 11, wherein the magnetoresistive sensor includes any one of: a spin valve, a giant magnetoresistive sensor (GMR), an anisotropy magnetoresistive sensor (AMR), and a colossal magnetoresistive sensor (CMR).
20. The hard drive of claim 11, further comprising a shield layer that overlies the lead and the magnetoresistive sensor.

21. A read/write head for use in a data storage device, comprising:  
a write element; and  
a read element that includes:  
a magnetoresistive sensor having a side, and an upper surface that defines an edge;  
an underlayer that overlies the side of the magnetoresistive sensor;  
a hard bias layer that overlies at least part of the underlayer and that defines a hard bias junction with the underlayer;  
a lead formed atop the hard bias layer; and  
wherein the hard bias junction is recessed from the edge of the magnetoresistive sensor by a predetermined recess distance, to provide stability and sensitivity to the read element.
22. The read/write head of claim 21, wherein the lead extends toward the magnetoresistive sensor, between the hard bias junction and the magnetoresistive sensor edge.
23. The read/write head of claim 22, wherein the recess distance ranges between approximately 0.5 and 20 nm.
24. The read/write head of claim 21, wherein the underlayer extends to the magnetoresistive sensor edge.
25. The read/write head of claim 21, wherein the lead is recessed from the magnetoresistive sensor edge to form a flat profile of the shield layer over the upper surface of the magnetoresistive sensor, in order to reduce side track reading.

26. The read/write head of claim 25, wherein the underlayer extends to a lead junction that is recessed from the magnetoresistive sensor edge by a lead recess distance.

27. The read/write head of claim 26, wherein the lead recess distance ranges between approximately 0.5 and 20 nm.

28. The read/write head of claim 24, wherein the flat profile of the shield layer extends over substantially the entire width of the magnetoresistive sensor.

29. The read/write head of claim 21, wherein the magnetoresistive sensor includes any one of: a spin valve, a giant magnetoresistive sensor (GMR), an anisotropy magnetoresistive sensor (AMR), and a colossal magnetoresistive sensor (CMR).

30. The read/write head of claim 21, further comprising a shield layer that overlies the lead and the magnetoresistive sensor.